SEQUENCE LISTING

<110> Agriculture Victoria Services Pty Ltd
AgResearch Limited
Spangenberg, German
Emmerling, Michael
Simmonds, Jason
Winkworth, Amanda
Panter, Stephen

<120> Chlacone synthase dihydroflavonol-4-reductase and leucoanthrocyanidine reductase for clover, medic rygrass or fescue

<130> FREE.P-007

<150> 2003901797
<151> 2003-04-14

<150> 2003904369
<151> 2003-08-14

<150> PCT/AU2004/00494
<151> 2004-4-14

<160> 77

<170> PatentIn version 3.2

<210> 1
<211> 1447
<212> DNA
<213> Trifolium repens

<400> 1
gaattcacta gtgattaagc agtggtaaca acgcagagta cgcggggaac aaaaacaact 60

acgcatatta tatatatata tatatagtct ataattgaaa gaaactgcta aagatattat 120

taagatatgg tgagtgtagc tgaaattcgc aaggctcaga gggctgaagg ccctgcaacc 180

attttggcca ttggcactgc aaatccacca aaccgtgttg agcagagcac atatcctgat 240

ttctacttca aaattacaaa cagtgagcac aagactgagc tcaaagagaa gttccaacgc 300

atgtgtgaca aatccatgat caagagcaga tacatgtatc taacagaaga gattttgaaa 360

gaaaatccta gtctttgtga atacatggca ccttcattgg atgctaggca agacatggtg 420

gtggttgagg tacctagact tgggaaggag gctgcagtca aggccattaa agaatggggt 480

caaccaaagt caaagattac tcacttaatc ttttgcacca caagtggtgt tgacatgcct 540

ggtgctgatt accaactcac aaaactctta ggtcttcgcc catatgtgaa aaggtatatg 600

atgtaccaac aaggttgttt tgcaggaggc acggtgcttc gtttggcaaa agatttggcc 660

gagaacaaca aaggtgctcg tgtgctagtt gtttgttctg aagtcaccgc agtcacattt 720

cgcggcccca gtgatactca cttggacagt cttgttggac aagcattgtt tggagatgga 780

gccgctgcac taattgttgg ttctgatcca gtgcctgaaa ttgagaaacc aatatttgag 840

atggtttgga ctgcacaaac aattgctcca gacagtgaag gtgccattga tggtcatctt 900

cgtgaagctg ggctaacatt tcatcttctt aaagatgttc ctgggattgt atcaaagaac 960

attaataaag cattggttga ggctttccaa ccattaggaa tttctgacta caactcaatc 1020

ttttggattg cacacccggg tggacctgca attcttgatc aagtagaaca aaagctagcc 1080

ttgaagcccg aaaagatgag ggccacgagg gaagttctaa gtgaatatgg aaacatgtca 1140

agcgcatgtg tattgttcat cttagatgag atgcggaaga aatcggctca aaatggactt 1200

aagacaactg gagaaggact tgattggggt gtgttgttcg gcttcggacc aggacttacc 1260

attgaaaccg ttgttcttcg tagcgtggct atataagatg tgtgattgtt tttattttaa 1320

tgtattactt ttaatcttgc tgccttgaat ttcgatttaa gaataaataa atatatcttt 1380

tgataaaaaa aaaaaaaaaa aaaaaaaaaa aagtactctg cgttgttacc actgcttaat 1440

cgaattc 1447

<210> 2
<211> 389
<212> PRT
<213> Trifolium repens

<400> 2

```
Met Val Ser Val Ala Glu Ile Arg Lys Ala Gln Arg Ala Glu Gly Pro
1               5                  10                  15

Ala Thr Ile Leu Ala Ile Gly Thr Ala Asn Pro Pro Asn Arg Val Glu
            20                  25                  30

Gln Ser Thr Tyr Pro Asp Phe Tyr Phe Lys Ile Thr Asn Ser Glu His
        35                  40                  45

Lys Thr Glu Leu Lys Glu Lys Phe Gln Arg Met Cys Asp Lys Ser Met
    50                  55                  60

Ile Lys Ser Arg Tyr Met Tyr Leu Thr Glu Glu Ile Leu Lys Glu Asn
65                  70                  75                  80

Pro Ser Leu Cys Glu Tyr Met Ala Pro Ser Leu Asp Ala Arg Gln Asp
                85                  90                  95

Met Val Val Val Glu Val Pro Arg Leu Gly Lys Glu Ala Ala Val Lys
            100                 105                 110

Ala Ile Lys Glu Trp Gly Gln Pro Lys Ser Lys Ile Thr His Leu Ile
        115                 120                 125

Phe Cys Thr Thr Ser Gly Val Asp Met Pro Gly Ala Asp Tyr Gln Leu
    130                 135                 140

Thr Lys Leu Leu Gly Leu Arg Pro Tyr Val Lys Arg Tyr Met Met Tyr
145                 150                 155                 160

Gln Gln Gly Cys Phe Ala Gly Gly Thr Val Leu Arg Leu Ala Lys Asp
                165                 170                 175

Leu Ala Glu Asn Asn Lys Gly Ala Arg Val Leu Val Val Cys Ser Glu
            180                 185                 190

Val Thr Ala Val Thr Phe Arg Gly Pro Ser Asp Thr His Leu Asp Ser
        195                 200                 205
```

```
Leu Val Gly Gln Ala Leu Phe Gly Asp Gly Ala Ala Ala Leu Ile Val
    210                 215                 220

Gly Ser Asp Pro Val Pro Glu Ile Glu Lys Pro Ile Phe Glu Met Val
225                 230                 235                 240

Trp Thr Ala Gln Thr Ile Ala Pro Asp Ser Glu Gly Ala Ile Asp Gly
                245                 250                 255

His Leu Arg Glu Ala Gly Leu Thr Phe His Leu Leu Lys Asp Val Pro
            260                 265                 270

Gly Ile Val Ser Lys Asn Ile Asn Lys Ala Leu Val Glu Ala Phe Gln
        275                 280                 285

Pro Leu Gly Ile Ser Asp Tyr Asn Ser Ile Phe Trp Ile Ala His Pro
    290                 295                 300

Gly Gly Pro Ala Ile Leu Asp Gln Val Glu Gln Lys Leu Ala Leu Lys
305                 310                 315                 320

Pro Glu Lys Met Arg Ala Thr Arg Glu Val Leu Ser Glu Tyr Gly Asn
                325                 330                 335

Met Ser Ser Ala Cys Val Leu Phe Ile Leu Asp Glu Met Arg Lys Lys
            340                 345                 350

Ser Ala Gln Asn Gly Leu Lys Thr Thr Gly Glu Gly Leu Asp Trp Gly
        355                 360                 365

Val Leu Phe Gly Phe Gly Pro Gly Leu Thr Ile Glu Thr Val Val Leu
    370                 375                 380

Arg Ser Val Ala Ile
385
```

<210> 3
<211> 2394

<212> DNA
<213> Trifolium repens

<400> 3
gaattcgatt aagcagtggt aacaacgcag agtacgcggg gattcaatct gttgtgcata 60

aaattcactc attgcataga aaaccataca catttgatct tgcaaagaag aaatatggga 120

gacgaaggta tagtgagagg tgtcacaaag cagacaaccc ctgggaaggc tactatattg 180

gctcttggca aggcattccc tcaccaactt gtgatgcaag agtgtttagt tgatggttat 240

tttagggaca ctaattgtga caatcctgaa cttaagcaga aacttgctag actttgtaag 300

acaaccacgg taaaaacaag gtatgttgtt atgaatgagg agatactaaa gaaatatcca 360

gaacttgttg tcgaaggcgc ctcaactgta aaacaacgtt tagagatatg taatgaggca 420

gtaacacaaa tggcaattga agcttcccaa gtttgcctaa agaattgggg tagatcctta 480

tcggacataa ctcatgtggt ttatgtttca tctagtgaag ctagattacc cggtggtgac 540

ctatacttgt caaaaggact aggactaaac cctaaaattc aaagaaccat gctctatttc 600

tctggatgct cgggaggcgt agccggcctt cgcgttgcga aagacgtagc tgagaacaac 660

cctggaagta gagttttgct tgctacttcg gaaactacaa ttattggatt caagccacca 720

agtgttgata gaccttatga tcttgttggt gtggcactct ttggagatgg tgctggtgca 780

atgataattg gctcagaccc ggtatttgaa actgagacac cattgtttga gctgcatact 840

tcagctcagg agtttatacc agacaccgag aagaaaattg atgggcggct gacggaggag 900

ggcataagtt tcacactagc aagggaactt ccgcagataa tcgaagacaa tgttgaggga 960

ttctgtaata aactaattga tgttgttggg ttggagaata aggagtacaa taagttgttt 1020

tgggctgtgc atccaggtgg gcctgcgata ttgaatcgcg tggagaagcg gcttgagttg 1080

tcgccgcaga agctgaatgc tagtagaaaa gctctaatgg attatggaaa tgctagcagc 1140

aatactattg tttatgtgct ggaatatatg ctagaagagg aaaagaagat taaaaaggcg 1200

ggtggaggag attctgaatg gggattgata cttgcttttg gacctggaat tacttttgag 1260

gggattctag caaggaactt gtgtgcatga agtcttatac aattgtgatg catgacttat 1320

actcttattt ctactaatta ttatattaag caaattcaga acttttaagt aatgatttaa 1380

tgaagaatac ttatagtata ttgactttat tcactttcaa agcaagttta tgatcctaag 1440

acatggtaga acttgagcat gtggaatagt tgtaacaaaa actctaagca aatagagact 1500

ttatgtagta taaagcattt ccagacatga taaataatgg tacctcagaa cataaaatat 1560

atttagctat ctttcatccc caactttaca catccaccaa ggtacagaat aagcatatgt 1620

caacacaaaa tgtactctaa gtctaacatg agtaaccaaa catgatgcct gattaagtta 1680

aaagaaaaga aaatctgagg gcatagatct tcaatcacac cactccagag ggaaggcgta 1740

gaacaagctg tccgccgaaa acactgcaat tcaataaata tcattaggac aacagtgcag 1800

agtcatgcgg gaaatgtctt aagtcactgt actaaaaata taggattata ttatgaacta 1860

tactaacctt ttcacataat agtaacagaa atcagctaag atgaatgtct ggacaatttc 1920

tgagataaga accatgacgg ccataagcca taccccaagg caaccaataa atgtccacgg 1980

gtatctaaca cctgttgcaa gaaatagtaa gttattagga gatgtgcggt tacgaaattc 2040

aagctacaca acaaaaggag gccagaacaa cagcaatctt gtaaccagat gacaacaata 2100

aaatgtaaac ttaaagagac cgaacacaca aacattgcaa ctcagatgga attgctgcca 2160

tgtaactagt aggagatttg ggacgtcaaa tcagtatatt atgcaaatac aaggtatgac 2220

cgccttgtct attgtagcat acaacaaacg tacagtgggt ttgtccctct caaaatggca 2280

ggatctttac agcacaatat ttggttttgt catacttata ccataaaaaa aaaaaaaaaa 2340

aaaaaaaaaa aaagtactct gcgttgttac cactgcttaa tcactagtga attc 2394

<210> 4
<211> 391

<212> PRT
<213> Trifolium repens

<400> 4

Met Gly Asp Glu Gly Ile Val Arg Gly Val Thr Lys Gln Thr Thr Pro
1 5 10 15

Gly Lys Ala Thr Ile Leu Ala Leu Gly Lys Ala Phe Pro His Gln Leu
20 25 30

Val Met Gln Glu Cys Leu Val Asp Gly Tyr Phe Arg Asp Thr Asn Cys
35 40 45

Asp Asn Pro Glu Leu Lys Gln Lys Leu Ala Arg Leu Cys Lys Thr Thr
50 55 60

Thr Val Lys Thr Arg Tyr Val Val Met Asn Glu Glu Ile Leu Lys Lys
65 70 75 80

Tyr Pro Glu Leu Val Val Glu Gly Ala Ser Thr Val Lys Gln Arg Leu
85 90 95

Glu Ile Cys Asn Glu Ala Val Thr Gln Met Ala Ile Glu Ala Ser Gln
100 105 110

Val Cys Leu Lys Asn Trp Gly Arg Ser Leu Ser Asp Ile Thr His Val
115 120 125

Val Tyr Val Ser Ser Ser Glu Ala Arg Leu Pro Gly Gly Asp Leu Tyr
130 135 140

Leu Ser Lys Gly Leu Gly Leu Asn Pro Lys Ile Gln Arg Thr Met Leu
145 150 155 160

Tyr Phe Ser Gly Cys Ser Gly Gly Val Ala Gly Leu Arg Val Ala Lys
165 170 175

Asp Val Ala Glu Asn Asn Pro Gly Ser Arg Val Leu Leu Ala Thr Ser
180 185 190

```
Glu Thr Thr Ile Ile Gly Phe Lys Pro Pro Ser Val Asp Arg Pro Tyr
        195                 200                 205

Asp Leu Val Gly Val Ala Leu Phe Gly Asp Gly Ala Gly Ala Met Ile
    210                 215                 220

Ile Gly Ser Asp Pro Val Phe Glu Thr Glu Thr Pro Leu Phe Glu Leu
225                 230                 235                 240

His Thr Ser Ala Gln Glu Phe Ile Pro Asp Thr Glu Lys Lys Ile Asp
                245                 250                 255

Gly Arg Leu Thr Glu Glu Gly Ile Ser Phe Thr Leu Ala Arg Glu Leu
            260                 265                 270

Pro Gln Ile Ile Glu Asp Asn Val Glu Gly Phe Cys Asn Lys Leu Ile
        275                 280                 285

Asp Val Val Gly Leu Glu Asn Lys Glu Tyr Asn Lys Leu Phe Trp Ala
    290                 295                 300

Val His Pro Gly Gly Pro Ala Ile Leu Asn Arg Val Glu Lys Arg Leu
305                 310                 315                 320

Glu Leu Ser Pro Gln Lys Leu Asn Ala Ser Arg Lys Ala Leu Met Asp
                325                 330                 335

Tyr Gly Asn Ala Ser Ser Asn Thr Ile Val Tyr Val Leu Glu Tyr Met
            340                 345                 350

Leu Glu Glu Glu Lys Lys Ile Lys Lys Ala Gly Gly Gly Asp Ser Glu
        355                 360                 365

Trp Gly Leu Ile Leu Ala Phe Gly Pro Gly Ile Thr Phe Glu Gly Ile
    370                 375                 380

Leu Ala Arg Asn Leu Cys Ala
```

385 390

<210> 5
<211> 1653
<212> DNA
<213> Trifolium repens

<400> 5
gaattcgatt aagcagtggt aacaacgcag agtacgcggg actaagcctt gattcattgt 60

ttgtttccat aacacaagaa ctagtgtttg cttgaatctt aagaaaaaat gcctcaaggt 120

gatttgaatg gaagttcctc ggtgaatgga gcacgtgcta gacgtgctcc tactcaggga 180

aaggcaacga tacttgcatt aggaaaggct ttccccgccc aggtcctccc tcaagagtgc 240

ttggtggaag gattcattcg cgacactaag tgtgacgata cttatattaa ggagaaattg 300

gagcgtcttt gcaaaaacac aactgtgaaa acaagataca cagtaatgtc aaaggagatc 360

ttagacaact atccagagct agccatagat ggaacaccaa caataaggca aaagcttgaa 420

atagcaaatc cagcagtagt tgaaatggca acaagagcaa gcaaagattg catcaaagaa 480

tggggaaggt cacctcaaga tatcacacac atagtctatg tttcctcgag cgaaattcgt 540

ctacccggtg gtgaccttta tcttgcaaat gaactcggct taaacagcga tgttaatcgc 600

gtaatgctct atttcctcgg ttgctacggc ggtgtcactg gcttacgtgt cgccaaagac 660

atcgccgaaa ataaccctgg tagtagggtg ttactcacaa catccgagac cactattctc 720

ggttttcgac caccgagtaa agctagacct tatgacctcg ttggcgctgc acttttcggt 780

gatggcgccg ctgctgcaat aattggaaca gaccctatat tgaatcaaga atcacctttc 840

atggaattga accatgcagt ccaaaaattc ttgcctgata cacaaaatgt gattgatggt 900

agaatcactg aagagggtat taattttaag cttggaagag accttcctca aaaaattgaa 960

gacaatattg aagaattttg caagaaaatt atggctaaaa gtgatgttaa ggaatttaat 1020

gacttatttt gggctgttca tcctggtggg ccagctatac tcaataagct agaaaatata 1080

ctcaaattga aaagtgataa attggattgt agtaggaagg cattaatgga ttatggaaat 1140

gttagtagca atactatatt ctatgtgatg gagtatatga gagattattt gaaggaagat 1200

ggaagtgaag aatggggatt aggattggct tttggaccag ggattacttt tgaaggggtt 1260

ctcctccgta gcctttaatc ttgaaataat aattcatatg aaattacttg tcttaagatt 1320

gtgataggaa gatgaatatg tattggatta atattgatat ggtgttattt taagttgatt 1380

ttaaaaaaag tttattaata aagtatgatg taacaattgt tgtttgaatg ttaaaaggga 1440

agtatactat tttaagttct tgaccatact gatttttct ttacacattt tcatatctaa 1500

aattgttcta tgatatcttc attgttgata ctgtaataat ataatatcta atttggctgg 1560

caaaatgaaa gatttttcac cgaaaaaaaa aaaaaaaaaa aaaaaaaaaa aagtactctg 1620

cgttgttacc actgcttaat cactagtgaa ttc 1653

<210> 6
<211> 389
<212> PRT
<213> Trifolium repens

<400> 6

Met Pro Gln Gly Asp Leu Asn Gly Ser Ser Ser Val Asn Gly Ala Arg
1 5 10 15

Ala Arg Arg Ala Pro Thr Gln Gly Lys Ala Thr Ile Leu Ala Leu Gly
20 25 30

Lys Ala Phe Pro Ala Gln Val Leu Pro Gln Glu Cys Leu Val Glu Gly
35 40 45

Phe Ile Arg Asp Thr Lys Cys Asp Asp Thr Tyr Ile Lys Glu Lys Leu
50 55 60

Glu Arg Leu Cys Lys Asn Thr Thr Val Lys Thr Arg Tyr Thr Val Met
65 70 75 80

```
Ser Lys Glu Ile Leu Asp Asn Tyr Pro Glu Leu Ala Ile Asp Gly Thr
                85                  90                  95

Pro Thr Ile Arg Gln Lys Leu Glu Ile Ala Asn Pro Ala Val Val Glu
            100                 105                 110

Met Ala Thr Arg Ala Ser Lys Asp Cys Ile Lys Glu Trp Gly Arg Ser
        115                 120                 125

Pro Gln Asp Ile Thr His Ile Val Tyr Val Ser Ser Ser Glu Ile Arg
    130                 135                 140

Leu Pro Gly Gly Asp Leu Tyr Leu Ala Asn Glu Leu Gly Leu Asn Ser
145                 150                 155                 160

Asp Val Asn Arg Val Met Leu Tyr Phe Leu Gly Cys Tyr Gly Gly Val
                165                 170                 175

Thr Gly Leu Arg Val Ala Lys Asp Ile Ala Glu Asn Asn Pro Gly Ser
            180                 185                 190

Arg Val Leu Leu Thr Thr Ser Glu Thr Thr Ile Leu Gly Phe Arg Pro
        195                 200                 205

Pro Ser Lys Ala Arg Pro Tyr Asp Leu Val Gly Ala Ala Leu Phe Gly
    210                 215                 220

Asp Gly Ala Ala Ala Ala Ile Ile Gly Thr Asp Pro Ile Leu Asn Gln
225                 230                 235                 240

Glu Ser Pro Phe Met Glu Leu Asn His Ala Val Gln Lys Phe Leu Pro
                245                 250                 255

Asp Thr Gln Asn Val Ile Asp Gly Arg Ile Thr Glu Glu Gly Ile Asn
            260                 265                 270

Phe Lys Leu Gly Arg Asp Leu Pro Gln Lys Ile Glu Asp Asn Ile Glu
        275                 280                 285
```

Glu Phe Cys Lys Lys Ile Met Ala Lys Ser Asp Val Lys Glu Phe Asn
290 295 300

Asp Leu Phe Trp Ala Val His Pro Gly Gly Pro Ala Ile Leu Asn Lys
305 310 315 320

Leu Glu Asn Ile Leu Lys Leu Lys Ser Asp Lys Leu Asp Cys Ser Arg
325 330 335

Lys Ala Leu Met Asp Tyr Gly Asn Val Ser Ser Asn Thr Ile Phe Tyr
340 345 350

Val Met Glu Tyr Met Arg Asp Tyr Leu Lys Glu Asp Gly Ser Glu Glu
355 360 365

Trp Gly Leu Gly Leu Ala Phe Gly Pro Gly Ile Thr Phe Glu Gly Val
370 375 380

Leu Leu Arg Ser Leu
385

<210> 7
<211> 1600
<212> DNA
<213> Trifolium repens

<400> 7
gaattcacta gtgattaagc agtggtaaca acgcagagta cgcgggggaa tccaccaaat 60

caacaccatt aataaccttc caaattctcg ttacctcacc aaatctcatt tttcattata 120

tatcttgggt acatcttttg ttacctccaa caaaaaaatg gtgaccgtag aagagattcg 180

taacgcccaa cgttcaaatg gccctgccac tatcttagct tttggcacag ccactccttc 240

taactgtgtc actcaagctg attatcctga ttactacttt cgtatcacca acagcgaaca 300

tatgactgat cttaaggaaa aattcaagcg gatgtgtgat agatcaatga taaagaaacg 360

ttacatgcac ctaacagaag actttctgaa ggagaatcca aatatgtgtg aatacatggc 420

accatcacta gatgtaagac gagacatagt ggttgttgaa gtaccaaagc taggtaaaga 480

agcagcaaaa aaagccatat gtgaatgggg acaaccaaaa tccaaaatca cacatcttgt 540

tttctgcacc acttccggtg ttgacatgcc gggagccgat taccaactca ccaaactttt 600

aggcttaaaa ccttctgtca agcgtctcat gatgtatcaa caaggttgtt tcgctggcgg 660

cacagttctc cgcttagcaa aagaccttgt tgagaataac aaaaatgcaa gagttcttgt 720

tgtttgttct gaaattactg cggttacttt tcgtggacca tcggatactc atcttgattc 780

gctcgtggga caggcgcttt ttggtgatgg agccgcagca atgattattg gtgcggatcc 840

tgatttaacc gtggagcgtc cgattttcga gattgtttcg gctgctcaga ctattcttcc 900

tgattctgat ggcgcaattg atggacatct tcgtgaagtg gggctcactt ttcatttatt 960

gaaagatgtt ccggggatta tttcaaagaa cattgaaaaa agtttagttg aagcttttgc 1020

gcctattggg attaatgatt ggaactcaat attttgggtt gcacatccag gtggaccggc 1080

tattttagac caggttgaag agaaactcca tcttaaagag gagaaactcc ggtccacccg 1140

gcatgtgctt agtgaatatg gaaatatgtc aagtgcatgt gttttattta ttttggatga 1200

aatgagaaag aggtctaaag aggaagggat gattacaact ggtgaagggt tggaatgggg 1260

tgtgttgttt gggtttggac cgggtttaac tgttgaaacc gttgtgcttc atagtgttcc 1320

ggttcagggt tgaatttatt atacatagat tggaaaataa aatttgcctg ccgagagatg 1380

tgaactaact ttgtaggcaa gctcaaatta aagtttgaga taatattgtg ctttagttat 1440

tatggtatgt aatgtaatgt ttttactttt ttcgaaattc atgtaatttg atatgtaaag 1500

taatatgttt gggttggaat ataattattt gttaactaaa aaaaaaaaaa aaaaaaaaaa 1560

aaaaagtact ctgcgttgtt accactgctt aatcgaattc 1600

<210> 8

<211> 391
<212> PRT
<213> Trifolium repens

<400> 8

Met Val Thr Val Glu Glu Ile Arg Asn Ala Gln Arg Ser Asn Gly Pro
1 5 10 15

Ala Thr Ile Leu Ala Phe Gly Thr Ala Thr Pro Ser Asn Cys Val Thr
20 25 30

Gln Ala Asp Tyr Pro Asp Tyr Tyr Phe Arg Ile Thr Asn Ser Glu His
35 40 45

Met Thr Asp Leu Lys Glu Lys Phe Lys Arg Met Cys Asp Arg Ser Met
50 55 60

Ile Lys Lys Arg Tyr Met His Leu Thr Glu Asp Phe Leu Lys Glu Asn
65 70 75 80

Pro Asn Met Cys Glu Tyr Met Ala Pro Ser Leu Asp Val Arg Arg Asp
85 90 95

Ile Val Val Val Glu Val Pro Lys Leu Gly Lys Glu Ala Ala Lys Lys
100 105 110

Ala Ile Cys Glu Trp Gly Gln Pro Lys Ser Lys Ile Thr His Leu Val
115 120 125

Phe Cys Thr Thr Ser Gly Val Asp Met Pro Gly Ala Asp Tyr Gln Leu
130 135 140

Thr Lys Leu Leu Gly Leu Lys Pro Ser Val Lys Arg Leu Met Met Tyr
145 150 155 160

Gln Gln Gly Cys Phe Ala Gly Gly Thr Val Leu Arg Leu Ala Lys Asp
165 170 175

Leu Val Glu Asn Asn Lys Asn Ala Arg Val Leu Val Val Cys Ser Glu

```
            180                 185                 190

Ile Thr Ala Val Thr Phe Arg Gly Pro Ser Asp Thr His Leu Asp Ser
        195                 200                 205

Leu Val Gly Gln Ala Leu Phe Gly Asp Gly Ala Ala Ala Met Ile Ile
    210                 215                 220

Gly Ala Asp Pro Asp Leu Thr Val Glu Arg Pro Ile Phe Glu Ile Val
225                 230                 235                 240

Ser Ala Ala Gln Thr Ile Leu Pro Asp Ser Asp Gly Ala Ile Asp Gly
                245                 250                 255

His Leu Arg Glu Val Gly Leu Thr Phe His Leu Leu Lys Asp Val Pro
            260                 265                 270

Gly Ile Ile Ser Lys Asn Ile Glu Lys Ser Leu Val Glu Ala Phe Ala
        275                 280                 285

Pro Ile Gly Ile Asn Asp Trp Asn Ser Ile Phe Trp Val Ala His Pro
    290                 295                 300

Gly Gly Pro Ala Ile Leu Asp Gln Val Glu Glu Lys Leu His Leu Lys
305                 310                 315                 320

Glu Glu Lys Leu Arg Ser Thr Arg His Val Leu Ser Glu Tyr Gly Asn
                325                 330                 335

Met Ser Ser Ala Cys Val Leu Phe Ile Leu Asp Glu Met Arg Lys Arg
            340                 345                 350

Ser Lys Glu Glu Gly Met Ile Thr Thr Gly Glu Gly Leu Glu Trp Gly
        355                 360                 365

Val Leu Phe Gly Phe Gly Pro Gly Leu Thr Val Glu Thr Val Val Leu
    370                 375                 380
```

His Ser Val Pro Val Gln Gly
385 390

<210> 9
<211> 1309
<212> DNA
<213> Trifolium repens

<400> 9
gaattcgatt aagcagtggt aacaacgcag agtacgcggg ataaaaactg cactagtgtg 60

tataagtttc ttggtgaaaa aagagtttgt aaattaacat catggctagt atcaaacaaa 120

ttggaaacaa gaaagcatgt gtgattggtg gcactggttt tgttgcatct atgttgatca 180

agcagttact tgaaaagggt tatgctgtta atactaccgt tagagaccca gatagcccta 240

agaaaatatc tcacctagtg gcactgcaaa gtttggggga actgaatcta tttagagcag 300

acttaacagt tgaagaagat tttgatgctc ctatagcagg atgtgaactt gtttttcaac 360

ttgctacacc tgtgaacttt gcttctcaag atcctgagaa tgacatgata aagccagcaa 420

tcaaaggtgt gttgaatgtg ttgaaagcaa ttgcaagagc aaaagaagtt aaaagagtta 480

tcttaacatc ttcggcagcc gcggtgacta taaatgaact caaagggaca ggtcatgtta 540

tggatgaaac caactggtct gatgttgaat ttctcaacac tgcaaaacca cccacttggg 600

gttatcctgc ctcaaaaatg ctagctgaaa aggctgcatg gaaatttgct gaagaaaatg 660

acattgatct aatcactgtg atacctagtt taacaactgg tccttctctc acaccagata 720

tcccatctag tgttggcttg gcaatgtctc taataacagg caatgatttt ctcataaatg 780

ctttgaaagg aatgcagttt ctgtcgggtt cgttatccat cactcatgtt gaggatattt 840

gccgagctca tatatttctt gcagagaaag aatcagcttc tggtagatac atttgctgtg 900

ctcacaatac tagtgttccc gagcttgcaa agtttctcaa caaacgatat cctcagtata 960

aagttccaac tgaatttgat gattgcccca gcaaggcaaa gttgataatc tcttctgaaa 1020

agcttatcaa agaagggttc agtttcaagc atggtattgc cgaaactttc gaccagactg 1080

tcgagtattt taagactaag ggggcactga agaattagat tttgatattt ctaattcaat 1140

agcaaactct aagcttgtta tgtgtttgtg aagttcagag tgaaatatca aatgaataag 1200

tggagagagc acaataagag gagagcacaa taattttgga aaaaaaaaaa aaaaaaaaaa 1260

aaaaaaaagt actctgcgtt gttaccactg cttaatcact agtgaattc 1309

<210> 10
<211> 338
<212> PRT
<213> Trifolium repens

<400> 10

Met Ala Ser Ile Lys Gln Ile Gly Asn Lys Lys Ala Cys Val Ile Gly
1 5 10 15

Gly Thr Gly Phe Val Ala Ser Met Leu Ile Lys Gln Leu Leu Glu Lys
20 25 30

Gly Tyr Ala Val Asn Thr Thr Val Arg Asp Pro Asp Ser Pro Lys Lys
35 40 45

Ile Ser His Leu Val Ala Leu Gln Ser Leu Gly Glu Leu Asn Leu Phe
50 55 60

Arg Ala Asp Leu Thr Val Glu Glu Asp Phe Asp Ala Pro Ile Ala Gly
65 70 75 80

Cys Glu Leu Val Phe Gln Leu Ala Thr Pro Val Asn Phe Ala Ser Gln
85 90 95

Asp Pro Glu Asn Asp Met Ile Lys Pro Ala Ile Lys Gly Val Leu Asn
100 105 110

Val Leu Lys Ala Ile Ala Arg Ala Lys Glu Val Lys Arg Val Ile Leu
115 120 125

```
Thr Ser Ser Ala Ala Ala Val Thr Ile Asn Glu Leu Lys Gly Thr Gly
    130                 135                 140

His Val Met Asp Glu Thr Asn Trp Ser Asp Val Glu Phe Leu Asn Thr
145                 150                 155                 160

Ala Lys Pro Pro Thr Trp Gly Tyr Pro Ala Ser Lys Met Leu Ala Glu
                165                 170                 175

Lys Ala Ala Trp Lys Phe Ala Glu Glu Asn Asp Ile Asp Leu Ile Thr
            180                 185                 190

Val Ile Pro Ser Leu Thr Thr Gly Pro Ser Leu Thr Pro Asp Ile Pro
        195                 200                 205

Ser Ser Val Gly Leu Ala Met Ser Leu Ile Thr Gly Asn Asp Phe Leu
    210                 215                 220

Ile Asn Ala Leu Lys Gly Met Gln Phe Leu Ser Gly Ser Leu Ser Ile
225                 230                 235                 240

Thr His Val Glu Asp Ile Cys Arg Ala His Ile Phe Leu Ala Glu Lys
                245                 250                 255

Glu Ser Ala Ser Gly Arg Tyr Ile Cys Cys Ala His Asn Thr Ser Val
            260                 265                 270

Pro Glu Leu Ala Lys Phe Leu Asn Lys Arg Tyr Pro Gln Tyr Lys Val
        275                 280                 285

Pro Thr Glu Phe Asp Asp Cys Pro Ser Lys Ala Lys Leu Ile Ile Ser
    290                 295                 300

Ser Glu Lys Leu Ile Lys Glu Gly Phe Ser Phe Lys His Gly Ile Ala
305                 310                 315                 320

Glu Thr Phe Asp Gln Thr Val Glu Tyr Phe Lys Thr Lys Gly Ala Leu
                325                 330                 335
```

Lys Asn

<210> 11
<211> 1409
<212> DNA
<213> Trifolium repens

<400> 11
gaattcgatt aagcagtggt aacaacgcag agtacgcggg gataccaaca ttgtcacaat 60

taactctaaa agcaaagcaa tggcaccagc agcaacatca tcaccaacca ctcctactac 120

taccaagggt cgtgtcctaa ttgttggagg aacaggtttc attggaaaat ttgtaactga 180

ggcaagtctt tccacaacac acccaaccta cttgttggtt cggccaggac ctcttctctc 240

ttctaaggct gccactatta aggcattcca agagaaaggt gccattgtca tttatggtcg 300

ggtaaataat aaggagttca tggagatgat tttgaaaaag tatgagataa atgtagtcat 360

ttctgcaata ggaggctctg atggcttgct ggaacagctt actttggtgg aggccatgaa 420

atctattaac accattaaga ggtttttgcc ttcggaattt ggtcacgatg tggacagagc 480

aaatcctgtg gaacctggcc taacaatgta caaacagaaa cgtttggtta gacgtgtgat 540

cgaagaatct ggtataccat acacctacat ctgttgcaat tcgatcgcat cttggccgta 600

ctatgacaat tgtcatccat cacagcttcc tccaccgttg gatcaattac atatttatgg 660

tcatggcgat gtcaaagctt actttgttga tggctatgat attgggaaat tcacaatgaa 720

ggtcattgat gatgaaagaa caatcaacaa aaatgttcat tttcgacctt ctaacaattg 780

ttatagcatg aatgagcttg cttctttgtg ggaaaacaaa attgcacgaa aaattcctag 840

agtgatcgtc tctgaagacg atcttctagc aatagccgca gaaaattgca taccggaaag 900

tgtcgtggca ccaatcactc atgatatatt catcaatgga tgtcaagtta acttcaagat 960

agatggaatt catgatgttg aaattggcac tctatatcct ggtgaatcgg taagaagttt 1020

ggaggaatgc tatgagaaat ttgttgtcat ggcggctgac aagattcata aagaagaaac 1080

tggagttacc gcaggtgggg gcggcacaac ggctatggta gagccggtgc caatcacagc 1140

ttcctgttga aaaggttcac ctgaggtgga tattcttttg agtcataaga catgttgatt 1200

gttgatgttg ttttcaagaa tgtttcatca tttcatgtgt tttattaatc ctaagtacaa 1260

ataattgctg tctacgtacg ttcttagttg caaaaattct tgttattctc tattgaggta 1320

aaagtcttca tgtttacaaa aaaaaaaaaa aaaaaaaaaa aaaaaaaagt actctgcgtt 1380

gttaccactg cttaatcact agtgaattc 1409

<210> 12
<211> 356
<212> PRT
<213> Trifolium repens

<400> 12

Met Ala Pro Ala Ala Thr Ser Ser Pro Thr Thr Pro Thr Thr Thr Lys
1 5 10 15

Gly Arg Val Leu Ile Val Gly Gly Thr Gly Phe Ile Gly Lys Phe Val
20 25 30

Thr Glu Ala Ser Leu Ser Thr Thr His Pro Thr Tyr Leu Leu Val Arg
35 40 45

Pro Gly Pro Leu Leu Ser Ser Lys Ala Ala Thr Ile Lys Ala Phe Gln
50 55 60

Glu Lys Gly Ala Ile Val Ile Tyr Gly Arg Val Asn Asn Lys Glu Phe
65 70 75 80

Met Glu Met Ile Leu Lys Lys Tyr Glu Ile Asn Val Val Ile Ser Ala
85 90 95

Ile Gly Gly Ser Asp Gly Leu Leu Glu Gln Leu Thr Leu Val Glu Ala
100 105 110

```
Met Lys Ser Ile Asn Thr Ile Lys Arg Phe Leu Pro Ser Glu Phe Gly
        115                 120                 125

His Asp Val Asp Arg Ala Asn Pro Val Glu Pro Gly Leu Thr Met Tyr
    130                 135                 140

Lys Gln Lys Arg Leu Val Arg Arg Val Ile Glu Glu Ser Gly Ile Pro
145                 150                 155                 160

Tyr Thr Tyr Ile Cys Cys Asn Ser Ile Ala Ser Trp Pro Tyr Tyr Asp
                165                 170                 175

Asn Cys His Pro Ser Gln Leu Pro Pro Pro Leu Asp Gln Leu His Ile
            180                 185                 190

Tyr Gly His Gly Asp Val Lys Ala Tyr Phe Val Asp Gly Tyr Asp Ile
        195                 200                 205

Gly Lys Phe Thr Met Lys Val Ile Asp Asp Glu Arg Thr Ile Asn Lys
    210                 215                 220

Asn Val His Phe Arg Pro Ser Asn Asn Cys Tyr Ser Met Asn Glu Leu
225                 230                 235                 240

Ala Ser Leu Trp Glu Asn Lys Ile Ala Arg Lys Ile Pro Arg Val Ile
                245                 250                 255

Val Ser Glu Asp Asp Leu Leu Ala Ile Ala Ala Glu Asn Cys Ile Pro
            260                 265                 270

Glu Ser Val Val Ala Pro Ile Thr His Asp Ile Phe Ile Asn Gly Cys
        275                 280                 285

Gln Val Asn Phe Lys Ile Asp Gly Ile His Asp Val Glu Ile Gly Thr
    290                 295                 300

Leu Tyr Pro Gly Glu Ser Val Arg Ser Leu Glu Glu Cys Tyr Glu Lys
305                 310                 315                 320
```

Phe Val Val Met Ala Ala Asp Lys Ile His Lys Glu Glu Thr Gly Val
325 330 335

Thr Ala Gly Gly Gly Gly Thr Thr Ala Met Val Glu Pro Val Pro Ile
340 345 350

Thr Ala Ser Cys
355

<210> 13
<211> 1551
<212> DNA
<213> Trifolium repens

<400> 13
gaattcgatt aagcagtggt aacaacgcag agtacgcggg aggatccttc cattttgcat 60

accaacattg tcacaattaa ctctaaaagc aaagcaatgg caccagcagc aacatcatca 120

ccaaccactc ctactactac caagggtcgt gtcctaattg ttggaggaac aggtttcatt 180

ggaaaatttg taactgaggc aagtctttcc acaacacacc caacctactt gttggttcgg 240

ccaggacctc ttctctcttc taaggctgcc actattaagg cattccaaga gaaaggtgcc 300

attgtcattt atggtcgggt aaataataag gagttcatgg agatgatttt gaaaaagtat 360

gagataaatg tagtcatttc tgcaatagga ggctctgatg gcttgctgga acagcttact 420

ttggtggagg ccatgaaatc tattaacacc attaagaggt ttttgccttc agaatttggt 480

cacgatgtgg acagagcaaa tcctgtggaa cctggcctaa caatgtacaa acagaaacgt 540

ttggttagac gtgtgatcga agaatctggt gtaccataca cctacatctg ttgcaattcg 600

atcgcatcct ggccgtacta tgacaattgt catccatcac agcttcctcc accgttggat 660

caattacata tttatggtca tggcgatgtc aaagcttact ttgttgatgg ctatgatatt 720

gggaaattca caatgaaggt cattgatgat gaaagaacaa tcaacaaaaa tgttcatttt 780

cgaccttcta acaattgtta tagcatgaat gagcttgctt ctttgtggga aaacaaaatt 840

gcacgaaaaa ttcctagagt gatcgtctct gaagacgatc ttctagcaat agccgcagaa 900

aactgcatac cggaaagtgt tgtggcatca atcactcatg atatattcat caatggatgt 960

caagttaact tcaaggtaga tggaattcat gatgttgaaa ttggcactct atatcctggt 1020

gaatcggtaa gaagtttgga ggaatgctat gagaaatttg ttgtcatggc ggctgacaag 1080

attcataaag aagaaactgg agttaccgca ggtgggggcg gcacaacggc tatggtagag 1140

ccggtgccaa tcacagcttc ctgttgaaaa ggttcacctg aggtggatat tcttttgagt 1200

cataagacat gttgattgtt gatgttgttt tcaagaatgt ttcatcattt catgtgtttt 1260

attaatccta agtacaaata attgctgtct acgtacgttc ttagttgcga aaattcttgt 1320

tattctctat tggggtaaaa gtcttcatgt ttattgtagt tgtgttggtt tttcatatat 1380

gctatttgca ataatgattt ttgtgaagca cttgtggtgt atttacttac tactgaaaat 1440

aatggttaca caaaatatat aaaaaaataa aaataagcaa aaaaaaaaaa aaaaaaaaaa 1500

aaaaaaaaaa gtactctgcg ttgttaccac tgcttaatca ctagtgaatt c 1551

<210> 14
<211> 356
<212> PRT
<213> Trifolium repens

<400> 14

Met Ala Pro Ala Ala Thr Ser Ser Pro Thr Thr Pro Thr Thr Thr Lys
1 5 10 15

Gly Arg Val Leu Ile Val Gly Gly Thr Gly Phe Ile Gly Lys Phe Val
20 25 30

Thr Glu Ala Ser Leu Ser Thr Thr His Pro Thr Tyr Leu Leu Val Arg
35 40 45

```
Pro Gly Pro Leu Leu Ser Ser Lys Ala Ala Thr Ile Lys Ala Phe Gln
    50                  55                  60

Glu Lys Gly Ala Ile Val Ile Tyr Gly Arg Val Asn Asn Lys Glu Phe
65                  70                  75                  80

Met Glu Met Ile Leu Lys Lys Tyr Glu Ile Asn Val Val Ile Ser Ala
                85                  90                  95

Ile Gly Gly Ser Asp Gly Leu Leu Glu Gln Leu Thr Leu Val Glu Ala
            100                 105                 110

Met Lys Ser Ile Asn Thr Ile Lys Arg Phe Leu Pro Ser Glu Phe Gly
        115                 120                 125

His Asp Val Asp Arg Ala Asn Pro Val Glu Pro Gly Leu Thr Met Tyr
    130                 135                 140

Lys Gln Lys Arg Leu Val Arg Arg Val Ile Glu Glu Ser Gly Val Pro
145                 150                 155                 160

Tyr Thr Tyr Ile Cys Cys Asn Ser Ile Ala Ser Trp Pro Tyr Tyr Asp
                165                 170                 175

Asn Cys His Pro Ser Gln Leu Pro Pro Pro Leu Asp Gln Leu His Ile
            180                 185                 190

Tyr Gly His Gly Asp Val Lys Ala Tyr Phe Val Asp Gly Tyr Asp Ile
        195                 200                 205

Gly Lys Phe Thr Met Lys Val Ile Asp Asp Glu Arg Thr Ile Asn Lys
    210                 215                 220

Asn Val His Phe Arg Pro Ser Asn Asn Cys Tyr Ser Met Asn Glu Leu
225                 230                 235                 240

Ala Ser Leu Trp Glu Asn Lys Ile Ala Arg Lys Ile Pro Arg Val Ile
                245                 250                 255
```

Val Ser Glu Asp Asp Leu Leu Ala Ile Ala Ala Glu Asn Cys Ile Pro
260 265 270

Glu Ser Val Val Ala Ser Ile Thr His Asp Ile Phe Ile Asn Gly Cys
275 280 285

Gln Val Asn Phe Lys Val Asp Gly Ile His Asp Val Glu Ile Gly Thr
290 295 300

Leu Tyr Pro Gly Glu Ser Val Arg Ser Leu Glu Glu Cys Tyr Glu Lys
305 310 315 320

Phe Val Val Met Ala Ala Asp Lys Ile His Lys Glu Glu Thr Gly Val
325 330 335

Thr Ala Gly Gly Gly Gly Thr Thr Ala Met Val Glu Pro Val Pro Ile
340 345 350

Thr Ala Ser Cys
355

<210> 15
<211> 1384
<212> DNA
<213> Trifolium repens

<400> 15
gaattcgatt aagcagtggt aacaacgcag agtacgcggg gataccaaca ttgtcacaat 60

taactctaaa agtaaagcaa tggcaccagc agcaacatca tcaccaacca ctcccactac 120

taccaagggt cgtgtcctaa ttgttggagg aacaggtttc attggaaaat ttgtaactga 180

ggcaagtctt tccacaacac acccaaccta cttgttggtt cggccaggac ctcttctctc 240

ttctaaggct gccactatta aggcattcca agagaaaggt gccattgtca tttatggtcg 300

ggtaaataat aaggagttca tggagatgat tttgaaaaag tatgagataa atgtagtcat 360

ttctgcaata ggaggctctg atggcttgct ggaacagctt actttggtgg aggccatgaa 420

atctattaac accattaaga ggtttttgcc ttcggaattt ggtcacgatg tggacagagc 480

agatcctgtg gaacctggcc taacaatgta caaacagaaa cgtttggtta gacgtgtgat 540

cgaagaatct ggtataccat acacctacat ctgttgcaat tcgatcgcat cttggccgta 600

ctatgacaat tgtcatccat cacagcttcc tccaccgttg gatcaattac atatttatgg 660

tcatggcgat gtcaaagctt actttgttga tggctatgat attgggaaat tcacaatgaa 720

ggtcattgat gatgaaagaa caatcaacaa aaatgttcat tttcgacctt ctaacaattg 780

ttatagcatg aatgagcttg cttctttgtg ggaaaacaaa attgcacgaa aaattcctag 840

agtgatcgtc tctgaagacg atcttctagc aatagccgca gaaaattgca taccggaaag 900

tgtcgtggca ccaatcactc atgatatatt catcaatgga tgtcaagtta acttcaagat 960

agatggaatt catgatgttg aaattggcac tctatatcct ggtgaatcgg taagaagttt 1020

ggaggaatgc tatgagaaat ttgttgtcat ggcggctgac aagattcata aagaagaaac 1080

tggagttacc gcaggtgggg gcggcacaac ggctatggta gagccggtgc caatcacagc 1140

ttcctgttga aaaggttcac ctgaggtgga tattcttttg agtcataaga catgttgatt 1200

gttgatgttg ttttcaagaa tgtttcatca tttcatgtgt tttattaatc ctaagtacaa 1260

ataattgctg tctacgtacg ttcttagttg caaaaattct tgttattctc tatcaaaaaa 1320

aaaaaaaaaa aaaaaaaaaa aaagtactct gcgttgttac cactgcttaa tcactagtga 1380

attc 1384

<210> 16
<211> 356
<212> PRT
<213> Trifolium repens

<400> 16

Met Ala Pro Ala Ala Thr Ser Ser Pro Thr Thr Pro Thr Thr Thr Lys
1 5 10 15

```
Gly Arg Val Leu Ile Val Gly Gly Thr Gly Phe Ile Gly Lys Phe Val
            20                  25                  30

Thr Glu Ala Ser Leu Ser Thr Thr His Pro Thr Tyr Leu Leu Val Arg
        35                  40                  45

Pro Gly Pro Leu Leu Ser Ser Lys Ala Ala Thr Ile Lys Ala Phe Gln
    50                  55                  60

Glu Lys Gly Ala Ile Val Ile Tyr Gly Arg Val Asn Asn Lys Glu Phe
65                  70                  75                  80

Met Glu Met Ile Leu Lys Lys Tyr Glu Ile Asn Val Val Ile Ser Ala
                85                  90                  95

Ile Gly Gly Ser Asp Gly Leu Leu Glu Gln Leu Thr Leu Val Glu Ala
            100                 105                 110

Met Lys Ser Ile Asn Thr Ile Lys Arg Phe Leu Pro Ser Glu Phe Gly
        115                 120                 125

His Asp Val Asp Arg Ala Asp Pro Val Glu Pro Gly Leu Thr Met Tyr
    130                 135                 140

Lys Gln Lys Arg Leu Val Arg Arg Val Ile Glu Glu Ser Gly Ile Pro
145                 150                 155                 160

Tyr Thr Tyr Ile Cys Cys Asn Ser Ile Ala Ser Trp Pro Tyr Tyr Asp
                165                 170                 175

Asn Cys His Pro Ser Gln Leu Pro Pro Pro Leu Asp Gln Leu His Ile
            180                 185                 190

Tyr Gly His Gly Asp Val Lys Ala Tyr Phe Val Asp Gly Tyr Asp Ile
        195                 200                 205

Gly Lys Phe Thr Met Lys Val Ile Asp Asp Glu Arg Thr Ile Asn Lys
    210                 215                 220
```

Asn Val His Phe Arg Pro Ser Asn Asn Cys Tyr Ser Met Asn Glu Leu
225 230 235 240

Ala Ser Leu Trp Glu Asn Lys Ile Ala Arg Lys Ile Pro Arg Val Ile
245 250 255

Val Ser Glu Asp Asp Leu Leu Ala Ile Ala Ala Glu Asn Cys Ile Pro
260 265 270

Glu Ser Val Val Ala Pro Ile Thr His Asp Ile Phe Ile Asn Gly Cys
275 280 285

Gln Val Asn Phe Lys Ile Asp Gly Ile His Asp Val Glu Ile Gly Thr
290 295 300

Leu Tyr Pro Gly Glu Ser Val Arg Ser Leu Glu Glu Cys Tyr Glu Lys
305 310 315 320

Phe Val Val Met Ala Ala Asp Lys Ile His Lys Glu Glu Thr Gly Val
325 330 335

Thr Ala Gly Gly Gly Gly Thr Thr Ala Met Val Glu Pro Val Pro Ile
340 345 350

Thr Ala Ser Cys
355

<210> 17
<211> 18
<212> DNA
<213> Artificial

<220>
<223> Primer sequence

<400> 17
aggaggctgc agtcaagg 18

<210> 18

<211> 19
<212> DNA
<213> Artificial

<220>
<223> Primer sequence

<400> 18
tgcctgaaat tgagaaacc 19

<210> 19
<211> 18
<212> DNA
<213> Artificial

<220>
<223> Primer sequence

<400> 19
aaagctagcc ttgaagcc 18

<210> 20
<211> 19
<212> DNA
<213> Artificial

<220>
<223> Primer sequence

<400> 20
tcggacataa ctcatgtgg 19

<210> 21
<211> 18
<212> DNA
<213> Artificial

<220>
<223> Primer sequence

<400> 21
ttgggttgga gaataagg 18

<210> 22
<211> 18
<212> DNA
<213> Artificial

<220>
<223> Primer sequence

<400> 22
tggacattta ttggttgc 18

<210> 23
<211> 18
<212> DNA
<213> Artificial

<220>
<223> Primer sequence

<400> 23
tatcatgtct ggaaatgc 18

<210> 24
<211> 19
<212> DNA
<213> Artificial

<220>
<223> Primer sequence

<400> 24
agattgcatc aaagaatgg 19

<210> 25
<211> 17
<212> DNA
<213> Artificial

<220>
<223> Primer sequence

<400> 25
ggtccaaaag ccaatcc 17

<210> 26
<211> 18
<212> DNA
<213> Artificial

<220>
<223> Primer sequence

<400> 26
taagacgaga catagtgg 18

<210> 27
<211> 18
<212> DNA
<213> Artificial

<220>
<223> Primer sequence

<400> 27
tattcactaa gcacatgc 18

<210> 28
<211> 19
<212> DNA
<213> Artificial

<220>
<223> Primer sequence

<400> 28
tcatttctgc aataggagg 19

<210> 29
<211> 18
<212> DNA
<213> Artificial

<220>
<223> Primer sequence

<400> 29
atccacctca ggtgaacc 18

<210> 30
<211> 18
<212> DNA
<213> Artificial

<220>
<223> Primer sequence

<400> 30
aataggaggc tctgatgg 18

<210> 31
<211> 18
<212> DNA
<213> Artificial

<220>
<223> Primer sequence

<400> 31
atccacctca ggtgaacc 18

<210> 32
<211> 17
<212> DNA
<213> Artificial

<220>
<223> Primer sequence

<400> 32
aggctctgat ggcttgc 17

<210> 33
<211> 18
<212> DNA
<213> Artificial

<220>
<223> Primer sequence

<400> 33
atccacctca ggtgaacc 18

<210> 34
<211> 30
<212> DNA
<213> Artificial

<220>
<223> Primer sequence

<400> 34
gaattctaga agatatggtg agtgtagctg 30

<210> 35
<211> 30

<212> DNA
<213> Artificial

<220>
<223> Primer sequence

<400> 35
gaattctaga atcacacatc ttatatagcc 30

<210> 36
<211> 55
<212> DNA
<213> Artificial

<220>
<223> Primer sequence

<400> 36
ggggacaagt ttgtacaaaa aagcaggctt ctagaagata tggtgagtgt agctg 55

<210> 37
<211> 55
<212> DNA
<213> Artificial

<220>
<223> Primer sequence

<400> 37
ggggaccact ttgtacaaga aagctgggtt ctagaatcac acatcttata tagcc 55

<210> 38
<211> 33
<212> DNA
<213> Artificial

<220>
<223> Primer sequence

<400> 38
gaattctaga agaagaaata tgggagacga agg 33

<210> 39
<211> 33
<212> DNA
<213> Artificial

<220>
<223> Primer sequence

<400> 39
gaattctaga aagacttcat gcacacaagt tcc 33

<210> 40
<211> 34
<212> DNA
<213> Artificial

<220>
<223> Primer sequence

<400> 40
gaattctaga tgattcattg tttgtttcca taac 34

<210> 41
<211> 31
<212> DNA
<213> Artificial

<220>
<223> Primer sequence

<400> 41
gaattctaga acatattcat cttcctatca c 31

<210> 42
<211> 31
<212> DNA
<213> Artificial

<220>
<223> Primer sequence

<400> 42
gaattctaga tccaaattct cgtacctcac c 31

<210> 43
<211> 31
<212> DNA
<213> Artificial

<220>
<223> Primer sequence

<400> 43
gaattctaga tagttcacat ctctcggcag g 31

<210> 44
<211> 37
<212> DNA
<213> Artificial

<220>
<223> Primer sequence

<400> 44
ggatcctcta gagcactagt gtgtataagt ttcttgg 37

<210> 45
<211> 35
<212> DNA
<213> Artificial

<220>
<223> Primer sequence

<400> 45
ggatcctcta gacccccttа gtcttaaaat actcg 35

<210> 46
<211> 52
<212> DNA
<213> Artificial

<220>
<223> Primer sequence

<400> 46
ggggacaagt ttgtacaaaa aagcaggctc tagaaagcaa agcaatggca cc 52

<210> 47
<211> 51
<212> DNA
<213> Artificial

<220>
<223> Primer sequence

<400> 47
ggggaccact ttgtacaaga aagctgggtc tagatccacc tcaggtgaac c 51

<210> 48
<211> 53
<212> DNA
<213> Artificial

<220>
<223> Primer sequence

<400> 48
ggggacaagt ttgtacaaaa aagcaggctc tagaaagcaa tggcaccagc agc 53

<210> 49
<211> 51
<212> DNA
<213> Artificial

<220>
<223> Primer sequence

<400> 49
ggggaccact ttgtacaaga aagctgggtc tagatccacc tcaggtgaac c 51

<210> 50
<211> 52
<212> DNA
<213> Artificial

<220>
<223> Primer sequence

<400> 50
ggggacaagt ttgtacaaaa aagcaggctc tagataaagc aatggcacca gc 52

<210> 51
<211> 51
<212> DNA
<213> Artificial

<220>
<223> Primer sequence

<400> 51
ggggaccact ttgtacaaga aagctgggtc tagatccacc tcaggtgaac c 51

<210> 52
<211> 36
<212> DNA

<213> Artificial

<220>
<223> Primer sequence

<400> 52
ccaccatgtt tgaaatttat tatgtgtttt tttccg 36

<210> 53
<211> 35
<212> DNA
<213> Artificial

<220>
<223> Primer sequence

<400> 53
taatcccggg taagggcagc ccatacaaat gaagc 35

<210> 54
<211> 36
<212> DNA
<213> Artificial

<220>
<223> Primer sequence

<400> 54
ataataaccg gttgatcatg agcggagaat taaggg 36

<210> 55
<211> 36
<212> DNA
<213> Artificial

<220>
<223> Primer sequence

<400> 55
ataatagcgg ccgctagtaa catagatgac accgcg 36

<210> 56
<211> 32
<212> DNA
<213> Artificial

<220>

<223> Primer sequence

<400> 56
aatagcggcc gcgatttagt actggatttt gg 32

<210> 57
<211> 31
<212> DNA
<213> Artificial

<220>
<223> Primer sequence

<400> 57
aataaccggt acccacgaag gagcatcgtg g 31

<210> 58
<211> 32
<212> DNA
<213> Artificial

<220>
<223> Primer sequence

<400> 58
ataataaccg gtgcccgggg atctcctttg cc 32

<210> 59
<211> 36
<212> DNA
<213> Artificial

<220>
<223> Primer sequence

<400> 59
ataatagcgg ccgcatgcat gttgtcaatc aattgg 36

<210> 60
<211> 34
<212> DNA
<213> Artificial

<220>
<223> Primer sequence

<400> 60

taataccggt aaatttatta tgrgtttttt tccg 34

<210> 61
<211> 37
<212> DNA
<213> Artificial

<220>
<223> Primer sequence

<400> 61
taatgcggcc gctaagggca gcccatacaa atgaagc 37

<210> 62
<211> 23
<212> DNA
<213> Artificial

<220>
<223> Primer sequence

<400> 62
catttcattt ggagaggaca cgc 23

<210> 63
<211> 21
<212> DNA
<213> Artificial

<220>
<223> Primer sequence

<400> 63
aacacggttt ggtggatttg c 21

<210> 64
<211> 22
<212> DNA
<213> Artificial

<220>
<223> Primer sequence

<400> 64
ttggagagga cacgctgaaa tc 22

<210> 65
<211> 21
<212> DNA
<213> Artificial

<220>
<223> Primer sequence

<400> 65
acaagttggt gagggaatgc c 21

<210> 66
<211> 23
<212> DNA
<213> Artificial

<220>
<223> Primer sequence

<400> 66
catttcattt ggagaggaca cgc 23

<210> 67
<211> 22
<212> DNA
<213> Artificial

<220>
<223> Primer sequence

<400> 67
tcgttgcctt tccctgagta gg 22

<210> 68
<211> 21
<212> DNA
<213> Artificial

<220>
<223> Primer sequence

<400> 68
tcatttggag aggacacgct g 21

<210> 69
<211> 24
<212> DNA
<213> Artificial

<220>
<223> Primer sequence

<400> 69
cggtcaccat ttttttgttg gagg 24

<210> 70
<211> 22
<212> DNA
<213> Artificial

<220>
<223> Primer sequence

<400> 70
ttggagagga cacgctgaaa tc 22

<210> 71
<211> 19
<212> DNA
<213> Artificial

<220>
<223> Primer sequence

<400> 71
caacaaaacc agtgccacc 19

<210> 72
<211> 22
<212> DNA
<213> Artificial

<220>
<223> Primer sequence

<400> 72
atgacgcaca atcccactat cc 22

<210> 73
<211> 24
<212> DNA
<213> Artificial

<220>
<223> Primer sequence

<400> 73
agccttagaa gagagaagag gtcc 24

<210> 74
<211> 22
<212> DNA
<213> Artificial

<220>
<223> Primer sequence

<400> 74
atgacgcaca atcccactat cc 22

<210> 75
<211> 24
<212> DNA
<213> Artificial

<220>
<223> Primer sequence

<400> 75
agccttagaa gagagaagag gtcc 24

<210> 76
<211> 22
<212> DNA
<213> Artificial

<220>
<223> Primer sequence

<400> 76
atgacgcaca atcccactat cc 22

<210> 77
<211> 24
<212> DNA
<213> Artificial

<220>
<223> Primer sequence

<400> 77
agccttagaa gagagaagag gtcc 24